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though the change may prove aperiodic, and a lesser one of about 70 years. Professor Newcomb says:⁵

Taken in connection with the recent exhaustive researches of Brown, which seem to be complete in determining with precision the action of every known mass of matter upon the moon, the present study seems to prove beyond serious doubt the actuality of the large unexplained fluctuations in the moon's mean motion to which I have called attention at various times during the past forty years.

And he concludes, after examining every known cause of motion, that "if we pass to unknown causes and inquire what is the simplest sort of action that would explain all the phenomena, the answer would be—a fluctuation in the attraction between the earth and the moon."⁶ This is in line with my present suggestion, but as yet we have no certain knowledge whether there is correspondence between the supposed attractive change and the solar emission of electrons. However, the comparison which Professor E. W. Brown has made between the variation of the moon's mean motion in longitude and the fluctuation in height of the maxima of the sun-spot curve⁷ lend considerable confirmation to the view that the 70-year period in the moon's motion is in fact due to a varying electric repulsion between the moon and the earth owing to the larger reception, by both bodies, of negative electrons when sun-spot maxima are highest and when, presumably, solar electronic emission is exceptionally great, with consequent slight reduction of gravitational control and loss of motion owing to electronic repulsion. We might suppose that the electrons thus received by our earth from the sun, form a fluctuating electronic "atmosphere," outside of the denser air, but attached to the planet. Nipher's experiment, however, favors the supposition that there is actual electronic penetration into the solid substance of the outer layers of the earth.

⁵ *Op. cit.*, p. 164.

⁶ *Op. cit.*, p. 169.

⁷ See Report of the Australian meeting of the British Association for the Advancement of Science, *Transactions Sect. A*, pages 311 to 321.

Professor Brown says:⁸ "With some change of phase the periods of high and low maxima correspond nearly with the fluctuations above," referring to his curve of the variations of the moon's motion in longitude, where negative values of the moon's motion-variation from the mean follow close after the high sun-spot maxima of 1780 and 1850, while positive lunar values (that is, increased speed from greater total attraction) are equally associated with the low solar maxima of the epochs near 1815 and 1885, or half way between the epochs of high sun-spot maxima. Nevertheless, as the electric hypothesis was then unbroached, Brown considered the connection open to doubt because, as he says, "it is difficult to understand how, under the electron theory of magnetic storms, the motions of moon and planets can be sensibly affected." But this difficulty which was felt when the only hypothesis in sight was that of some sort of *magnetic* effect, disappears in the light of the now known efficacy of electronic penetration. Similar, though much smaller variations, with apparently identical period, are found in the motions of Mercury and the Earth in respect to the sun, but in these there are some discrepancies, and until these are cleared up, the proposed explanation, though plausible and perhaps even probable, can not be considered as certainly established.

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FRANK PERKINS WHITMAN¹

PROFESSOR WHITMAN was of New England stock. The Whitman (originally Wightman) family came to Massachusetts in 1632. The line of Whitmans has included three clergymen. The father of Frank was William Warren, early in life a lawyer, but later engaged in business, who died in 1902, at the age of eighty-two. Caroline Keith Perkins, the mother of Frank, died at the age of forty-one. She and the mother of President Taylor,

⁸ *Op. cit.*, p. 321.

¹ Minute adopted by the Undergraduate Colleges of Western Reserve University.

of Vassar College, were sisters. Her father, Aaron Perkins, served the Baptist church as minister for over seventy years. The Perkins family also settled in Massachusetts early in the seventeenth century.

Professor Whitman was born and spent his boyhood years in Troy, N. Y. After attending a private academy, the high school, and also for a while a private home school in Pittsfield, he entered Brown University and graduated in 1874. He was a member of Alpha Delta Phi, Phi Beta Kappa, a Junior Exhibition speaker and on the commencement list. After graduation he taught in the English and Classical High School of Mowry and Goff for four years, at the same time pursuing graduate studies at Brown University, and received the master's degree in 1877. In the year 1878-9 he studied physics at the Massachusetts Institute of Technology, at the same time making astronomical observations with E. C. Pickering, and working on lenses with Alvan Clark. He spent the following year at the Johns Hopkins University. During this time he was associated with Mr. Newton Anderson, who later founded the University School in Cleveland.

In 1880 Professor Whitman was called to the professorship of physics at Rensselaer Polytechnic Institute at Troy, where he remained until he came to Cleveland. His work in Adelbert College and the College for Women began in 1886, and continued until 1918, when, after a year's leave of absence, he became professor emeritus. He acted as dean of Adelbert College from 1903 to 1906.

He was chairman of the physics section of the American Association for the Advancement of Science, and thus vice-president of the association, in 1898. His vice-presidential address was on the subject color-vision. Two years before he published a paper on the subject of the flicker photometer, an idea not original with him, but he developed its possibilities and it has since been perfected by others. His scientific ability was critical rather than creative. For this critical faculty there developed few opportunities, hence his scientific activities were confined mainly to

college halls. He was not a research scholar and never wished to be considered one, but he did have a profound knowledge of the great problems of physics and astronomy, and he kept up with the research work done in these branches. He devoted much of his attention to the possibilities of lecture experiments as a means of instruction. The construction and administration of the physics laboratory naturally received much of his time and interest. He never failed in the mass of executive work which is required in a college, and in this field he showed the greatest capacity and usefulness. In addition to his minor interest in local organizations, he was a member of Sigma Xi, of the American Physical Society, of the American Astronomical Society and of the Illuminating Engineering Society. He received the honorary degree of Sc.D. from Brown University in 1900. He was a trustee of the University School of Cleveland, and took an active interest in its development.

During his long connection with Western Reserve, Professor Whitman endeared himself to his colleagues in an unusual degree by his unfailing courtesy and generosity, the charm of his personality, the wisdom of his counsel, and the absolute integrity of his conduct. A righteous man, whose ear was ever open to the voice of an enlightened conscience, he inspired complete confidence and made himself a trusted leader. He brought honor to his profession, happiness to his friends, a rich service to the university; and in the halls of memory, his figure will long remain a type of perfect faithfulness.

HORATIO C. WOOD

HORATIO C. WOOD, M.D., LL.D., emeritus professor of materia medica, pharmacy and general therapeutics in the University of Pennsylvania Medical School, died, January 3. The obituary notice in the *Pennsylvania Gazette* states that for three generations members of the Wood family have been on the medical faculty. Dr. George Bacon Wood, one of the founders of the Philadelphia College of Pharmacy, and an uncle of Horatio C. Wood,